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GB 2229713 A

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(54) Abstract Title
Sheet feed assembly

(57) A sheet feed assembly comprises a sheet feeder 5, 6 and at least two sheet stores 1, 11 on opposite sides of the feeder, with transfer arrangements 15A, B for moving the sheets to opposite sides of the feeder which is operable in opposite directions to feed sheets to a common delivery position. The feeder consists of a pair of endless apertured belts 5, 6 and a central vacuum chamber (10).

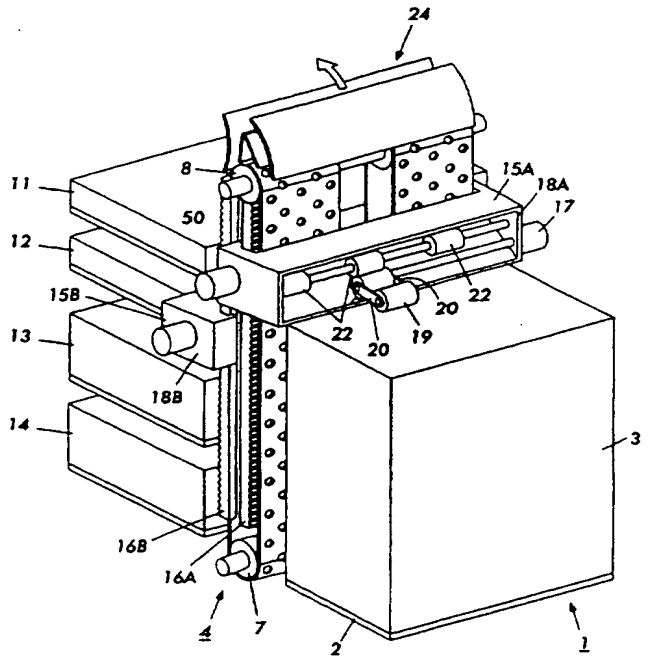

FIG. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

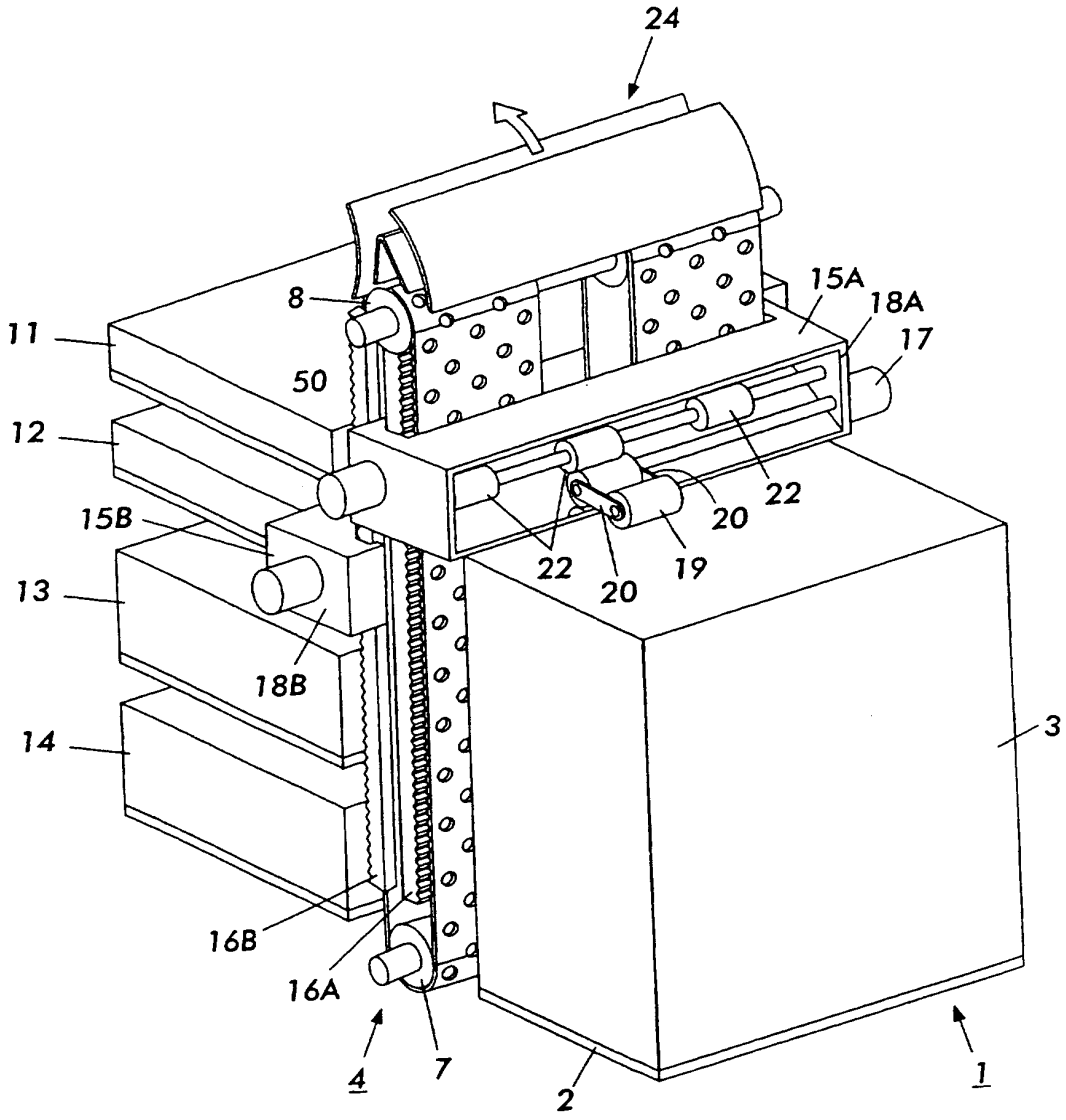

FIG. 1

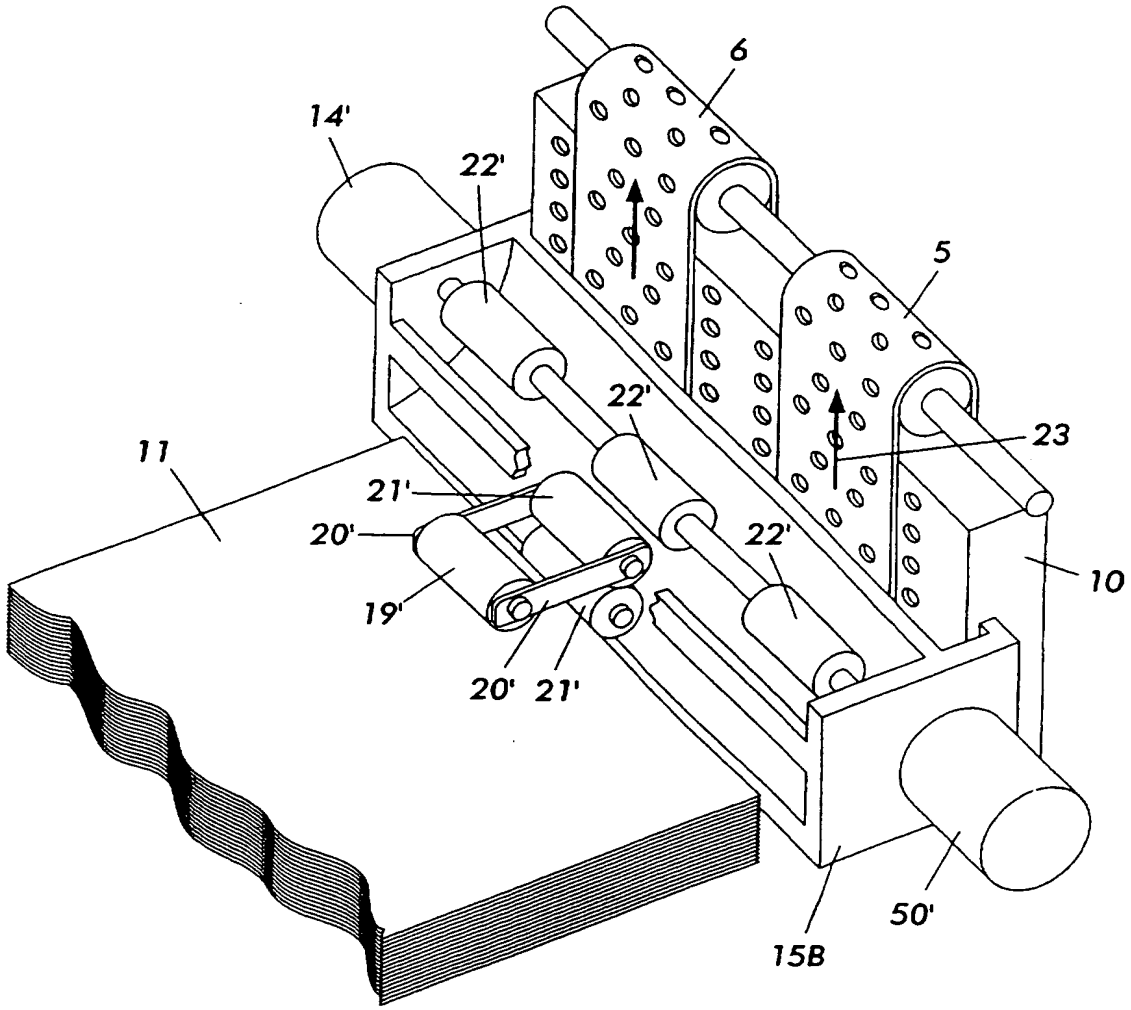

FIG. 2

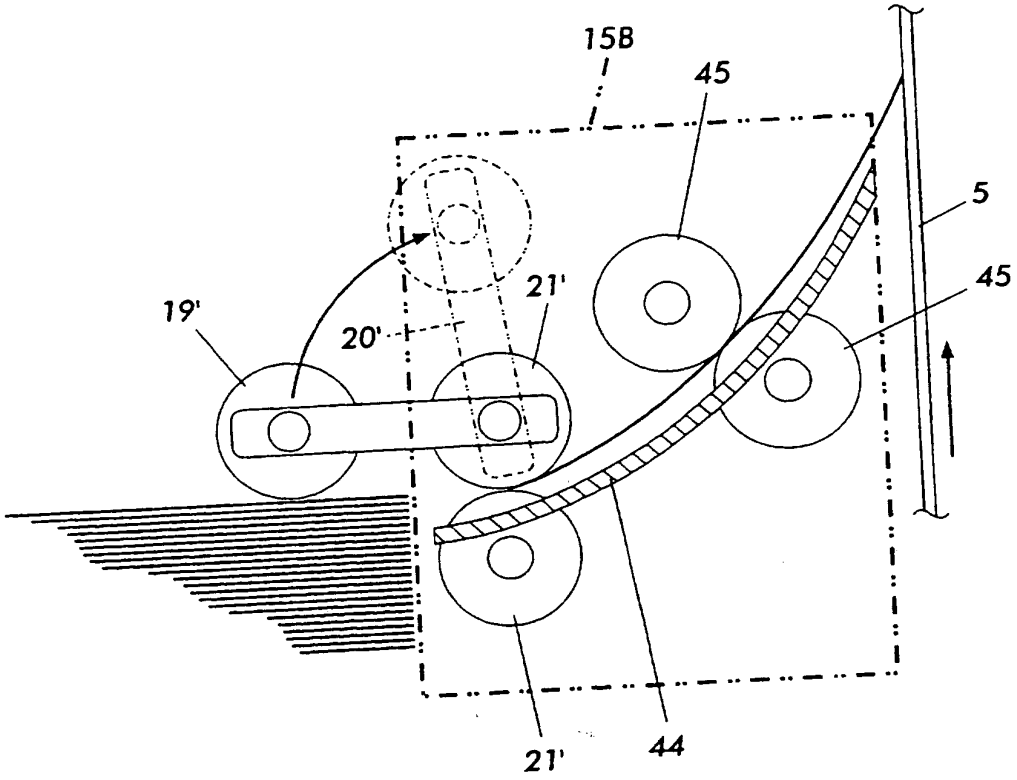

FIG. 3

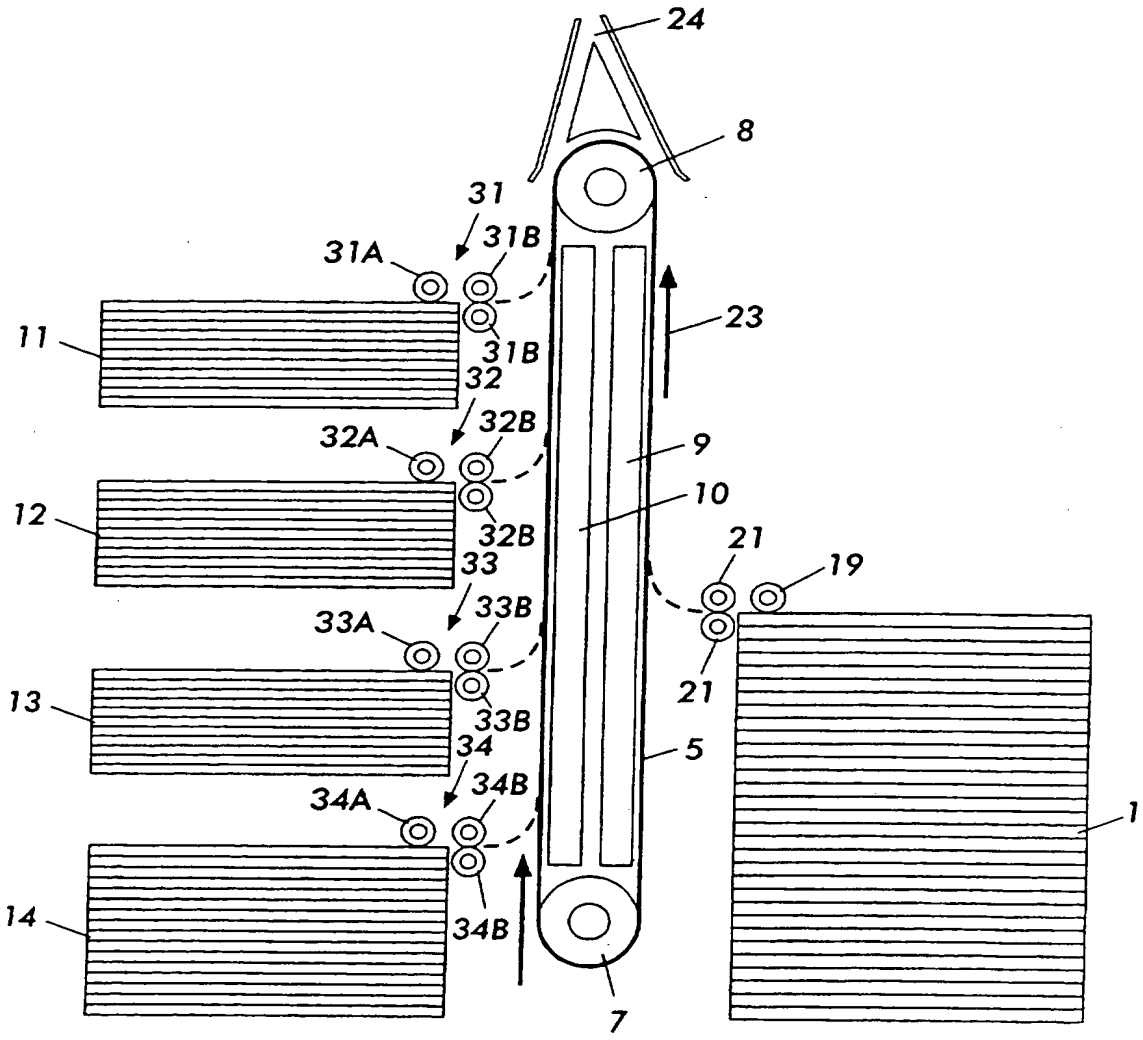
24
8
31
31A
31B
31B
11
23
32
32A
32B
9
12
10
32B
33
21
19
33A
33B
21
13
33B
34
5
34A
34B
1
14
34B
7

FIG. 4

SHEET FEED ASSEMBLY

The invention relates to a sheet feed assembly, particularly for use in copying machines.

In a typical copying machine, blank sheets are provided in a store and are then fed singly from the store to a copying station where an image is transferred onto the paper in a conventional manner, the imaged sheet then being fed to an output station. An example of a typical copying machine is described in US-A-5146286 which describes a particularly compact architecture in which the functions of copy sheet feeding and stacking are combined into one apparatus. Another example of a copying machine is described in US-A-4141545.

There is a continuing need to enable images to be reproduced on sheets of different type. In simple copying machines this requires that prior to the copying operation, a sheet of the particular type required is loaded into the sheet store for feeding to the copying station. More sophisticated copying machines include a number of sheet stores enabling sheets to be drawn from a selected one of those stores depending upon the type of sheet required. In a simple example, the different type of sheet may comprise sheets of different sizes, for example A4 and A3. At present, relatively complex sheet feed systems are needed to convey sheets from the different stores to the copying station.

In accordance with one aspect of the present invention, a sheet feed assembly comprises a movably mounted sheet feed member; at least two sheet stores; and means for transferring sheets from the stores to the sheet feed member, whereby the sheet transfer means transfers sheets from the stores to respective opposite sides of the sheet feed member, the sheet feed member being operable in opposite directions to feed the transferred sheets to a common delivery position.

We have devised a much more compact sheet feed assembly in which the same sheet feed member can be used to feed sheets from more than one store by moving the sheet feed member in one of two opposite directions.

The sheet feed member could comprise one or more rotatably mounted rollers, particularly friction rollers, but preferably comprises a rotatably mounted endless belt which in the preferred arrangement is vertically oriented. Although the belt could be provided with a high friction surface for feeding the sheets, preferably it forms part of a vacuum feed system. Such systems are relatively cheap to implement and yet with the present arrangement can achieve reliable feeding.

The common delivery position could be constituted by a further sheet feed system, an outlet station, a copying position or the like depending upon the apparatus into which the sheet feed assembly is incorporated.

In a preferred arrangement, the sheet stores are positioned to allow the topmost sheet to be transferred to the sheet feed member, each sheet store being stationary and the sheet transfer means being movable into engagement with the topmost sheet of each store.

Although movable stores could be used, stationary stores are preferred since this enables the stores to have much higher capacity. A typical 2.5K paper stack weighs approximately 12 kilograms and so would require a strong motor using considerable power to drive the sheet store into engagement with the sheet transfer means. However, much less power is needed to move the sheet transfer means into contact with the topmost sheet of a store. Of course, a mixture of stationary and movable stores could also be used.

Preferably, at least two stores are provided vertically spaced from one another, each store cooperating with the sheet transfer means to enable the topmost sheet of a selected store to be fed to the sheet feed member. Although a separate sheet transfer member could be

associated with each store, conveniently a single sheet transfer member is used which can be moved from one store to another. This again simplifies the overall construction of the assembly.

The use of a single sheet transfer member leads to a second aspect of the invention in which a sheet feed assembly comprises at least two sheet stores; a sheet feed member for receiving sheets from the stores and feeding them to a delivery position; and a sheet transfer means for transferring sheets from the stores to the sheet feed member, the sheet transfer means being movable into association with either sheet store to enable a sheet to be transferred from that store, the sheet transfer means including a nudger member which engages a sheet to be transferred and which can be retracted to enable the sheet transfer means to be moved between the sheet stores.

Although the sheet feed assembly according to the second aspect of the invention can be utilised to advantage with an assembly according to the first aspect of the invention, this is not essential. The second aspect of the invention again allows stationary sheet stores to be used with the advantages as mentioned above but in this case being serviced by the same sheet transfer means which moves from one to the other. Since a nudger member is included within the sheet transfer means, it is necessary for that nudger member to be retracted to enable the sheet transfer means to be moved between the sheet stores. However, the overall system is much simpler than known sheet feed assemblies. In particular, the sheet stores themselves do not need to be movable.

Using a single sheet transfer means saves considerable cost and, if the stores are stationary, requires much less power than that to move sheet stores. Furthermore, there will also be considerable space saving over the use of individual sheet transfer means.

The sheet feed assemblies according to the invention are particularly useful in copying machines such as

photocopying machines but can also be used in other apparatus where sheets need to be fed from at least two sheet stores.

Some examples of sheet feed assemblies for use in a copying machine will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a schematic, perspective view from one side of a first example;

Figure 2 is a schematic, perspective view from the other side of part of the first example;

Figure 3 is a schematic side elevation of the components shown in Figure 3; and,

Figure 4 is a schematic side elevation of a modified example.

The sheet feed assembly shown in Figures 1 to 3 comprises a high capacity sheet store 1 defined by a stationary support tray 2 on which a paper stack 3 is positioned in use. Typically, the sheet store 1 can hold up to 2.5K paper sheets. The sheet store 1 is provided adjacent to a vertically oriented vacuum feed system 4 comprising a pair of endless belts 5,6 each of which is perforated and which extend between an idler roller 7 and a vertically spaced drive roller 8 connected to a drive motor (not shown). The perforations in the belts 5,6 communicate with a pair of vacuum chambers (not shown), each of which communicates with a vacuum pump (not shown).

On the opposite side of the transport 4 from the store 1 is provided a number of additional stores 11-14 which are vertically spaced one above the other and comprise respective trays (as shown). Each store 11-14 has a capacity smaller than the store 1.

In order to feed sheets from the stores 1,11-14 to the feed system 4, a pair of vertically movable feed heads 15A,15B are provided, each supported on a pair of laterally spaced racks 16A,16B (only one of each shown in Figure 1), each rack cooperating with a pinion (not shown) located within the respective feed head 15A,15B and coupled with a

respective elevator motor secured to a main body 18A,18B of the feed head. The elevator motor 50 of the feed head 15A is shown in Figure 1. The feed head 15A also includes a nudger roll 19 mounted between a pair of arms 20 extending from the main body 18A. The nudger roll 19 is rotated in a clockwise direction (as seen in Figure 2) by a feeder drive, stepper motor 17 to draw the topmost sheet in the stack towards the feed head 15A and between a further pair of separator rollers 21 (only one shown in Figure 1) defining a sheet feed nip. The upper separator roll 21 is driven in the process direction and the lower in an anti-process direction via a friction clutch. This clutch is set so that the friction of a single sheet of paper being fed by the top separator roll 21 will override the clutch to allow the lower roll to be driven by the paper and thereby rotate in the process direction. Should there be more than one sheet of paper between these two rolls, the clutch friction is sufficiently higher than that of the friction of paper to paper so that the lower sheet is driven in the anti-process direction. A sheet passing through the nip defined between the rollers 21 is then fed under rollers 22 (driven by the motor 17') in the feed head 15A into engagement with the belts 5,6. The belts 5,6 are rotated in the direction indicated by arrow 23 (Figure 2) so that the sheet is conveyed vertically upwardly into a paper path 24 for onward feeding in a conventional manner to a copying station.

The nudger roll 19 also acts to detect the top of the paper stack 3 in a conventional manner and is connected to sensing equipment (not shown) so that as the feed head 15A is lowered towards the paper stack 3 by the elevator motor 50, engagement of the nudger roll 19 with the stack 3 is detected causing the motor 50 to terminate.

The feed head 15B has a similar construction to the head 15A and so the same reference numerals are used to illustrate similar parts but with the addition of a prime (see Figure 2). The vertical location of the head 15B is

determined using the rack 16B and pinion (not shown in Figure 2) although this could be replaced by elevation cables attached to upper rollers which are rotated to cause the feed head to take up the desired vertical position.

As can be seen in Figure 2, the head 15B is located to feed sheets from the store 11 with the nudger roller 19' in contact with the top most sheet. Figure 2 also shows a vacuum chamber 10 associated with the head 15B.

If it is desired to withdraw a sheet from one of the lower stores 12-14, the arms 20' are pivoted about their inner axis by a motor or solenoid (not shown) causing the nudger roller 19' to move to its retracted position as shown in Figure 3 at 43. The head 15B is then lowered to bring it into line with the appropriate store and the arms 20' then pivoted back to the extended position with the nudger roller 19' engaging the top most sheet of the selected store. One or more sheets can then be withdrawn from that store as before.

As can be seen in Figure 3, a sheet which has been withdrawn passes through the nip between the rollers 21' and is then guided by a guide 44 via drive rolls 45 to the vacuum drive belts 5,6.

Instead of providing a single feed head 15B, separate auxiliary feed heads 31-34 could be provided a shown in Figure 4. Each auxiliary feed head 31-34 is associated with each of the stores 11-14, each feed head having a nudger roll 31A-34A in contact with the topmost sheet of the appropriate sheet store. When a sheet is required, the appropriate feed head 31-34 is actuated so that the nudger roll 31A-34A nudges the topmost sheet into a nip between rollers 31B-34B respectively which feed the sheet towards the vacuum feed system 4. The belts 5,6 are rotated in the opposite direction so that once again the withdrawn sheet is fed upwardly to the outlet 24. In this case, both vacuum chambers 9,10 can be seen.

The Patent Office

Application No: GB 9821216.0
Claims searched: 1 - 6

Examiner: Howard Reeve
Date of search: 18 January 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): B8R (RAK)

Int Cl (Ed.6): B65H 3/44

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2229713 (HEIDELBERGER), pages 4 - 7	1, 4, 5

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.